

American University of Beirut
Mathematics Department
Fall Semester 2008-2009
Math 204 Final Exam

Time: 2 hrs

Name : _____

ID#: _____

- **Instructors:** Mrs. M. Itani Hatab ,Miss Lina Rahal & Miss Manal Salam

- **Circle your problem solving section:**

Section 5 : M @10:00

Section 6 : M @11:00

Section 7 : W @10:00

Section 8 : W @11:00

Section9 : Th @3:30

Section 10 : Th @2:00

Section 11 : Tu @12:00

Section 12 : Tu @11:00

- **Answer table for Part I**

1			9			17	
2			10			18	
3			11			19	
4			12			20	
5			13			21	
6			14			22	
7			15			23	
8			16			24	

# of correct answers : -----						Total
# of wrong answers : -----						
Grade of Part I						/ 60
1.	2.	3.	4.	5.	Grade of Part II	/ 40

Final Grade

Part I (60%) : 24 multiple choice questions with 2.5 points for each correct answer.

Circle the correct answer then, copy your answers as a, b, c or d on the table provided on page 1:

1. For a standard normal distribution $P(-1.3 < z < 0.45) =$

- a) 0.5768 b) 0.1451 c) 0.2296 d) 0.7251
-

2. If $P(B) = 0.4$, $P(A' \cap B) = 0.75$ and $P(A \cup B) = 0.7$, then $P(A) =$

- a) 0.4 b) 0.3 c) 0.5 d) 0.2
-

3. Given the matrices, $B = \begin{pmatrix} 5 & -1 \\ 0 & \frac{4}{3} \\ \frac{1}{3} & -2 \end{pmatrix}$, and $D = \begin{pmatrix} 5n-3m & n & 1 \\ -3 & 4 & -6 \end{pmatrix}$

If $3B = D^T$ then the constant $m =$

- a) 5 b) 3 c) -3 d) -5
-

4. If $A = \begin{pmatrix} -2x & -1 \\ -4 & 3 \end{pmatrix}$, and $A^{-1} = \begin{pmatrix} \frac{3}{2} & \frac{1}{2} \\ 2 & 1 \end{pmatrix}$, then $x =$

- a) 2 b) -1 c) 1 d) $\frac{1}{2}$
-

5. If $\int_a^b (2x^2 + 3x + 5)dx + \int_b^a (x^2 + 3x + 3)dx = \int_a^b f(x)dx$, then $f(x)$ can be

- a) $x^2 - 2x$ b) $3x^2 + 6x - 8$ c) $x^2 - 2$ d) $x^2 + 2$
-

6. If the matrix $A = (a_{ij})_{5 \times 4}$ is defined as $a_{ij} = \begin{cases} j-1 & \text{if } j \text{ is even} \\ j^2 - 2i & \text{if } j \text{ is odd} \end{cases}$ then $a_{33} + a_{24} = \dots$

- a) -2 b) 8 c) 6 d) 24
-

7. If $\frac{x^2 + 1}{(x-1)(x-2)(x-3)} = \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{x-3}$ then

- a) $C = 2$ b) $C = -5$ c) $C = 1$ d) $C = 5$
-

8. If the area to the left of z_0 on the standard normal curve is 0.0516 then the value of z_0 is....

- a) 1.63 b) -1.63 c) -1.96 d) 1.96
-

9. If $f(x,y) = 2yx^2 - y^3 + 4e^y (\ln x)$ then $f_x(2,0) =$

- a) 1 b) 0 c) 2 d) 5
-

10. There are 20 contestants in a beauty contest. In how many ways can the judges choose the three best contestants?

- a) $20!$ b) ${}_{20}C_3 = \binom{20}{3}$ c) ${}_{20}P_3$ d) 20^3
-

11. There are 20 contestants in a beauty contest. In how many ways can the judges choose the Beauty Queen, the first runner-up and the second runner-up?

- a) $20!$ b) ${}_{20}C_3 = \binom{20}{3}$ c) ${}_{20}P_3$ d) 20^3
-

12. A password consists of 2 distinct letters of the English alphabet followed by 2 digits such that the first digit is different from zero, then the number of passwords that can formed is.....

- a) $(26)^2(10)^2$ b) $25 \times 26 \times 9 \times 10$ c) $(25)^2(9)^2$ d) $25 \times 26 \times (10)^2$
-

13. X is a normally distributed variable with a mean equal to 40 and a standard deviation equal to 5. The probability that X is between 46.6 and 48 is

- a) 0.0542 b) 0.3462 c) 0.0386 d) 0.0575
-

Consider the definite integral: $I = \int_1^5 (25 - x^2) dx$.

14. The approximation of the definite integral I using the trapezoidal rule with $n=4$ is:

- a) 42 b) 58 c) 38 d) 48

15. The approximation of the definite integral I using the Simpson's rule with $n=4$ is:

- a) $\frac{136}{3}$ b) $\frac{156}{3}$ c) $\frac{126}{3}$ d) $\frac{176}{3}$
-

16. If $f(x) = e^{-5x}$ then $f^{(53)}(x) =$

- a) $5^{53} e^{-5x}$ b) $-53 e^{-5x}$ c) $-5^{53} e^{-5x}$ d) $-5 e^{-53x}$
-

17. All the critical points of the function $f(x, y) = x^4 - 2x^2 + y^2 - 6y + 10$ are.....

- a) (0, 3, 1) (1, 3, 0) (-1, 3, 0) b) (1, 3, 0) (-1, -3, 0) (0, 0, 10)
c) (1, 3, 0) (-1, 3, 0) d) (0, 3, 1) (1, 3, 0)

18. The point (1, 3, 0) is

- a) a saddle point b) a local minimum c) a local maximum d) not a critical point
-

The probability that a certain drug produces undesirable effects in all patients who use it is 0.2.

19. In a sample of six patients using the drug, the probability that exactly four patients have undesirable effects is

- a) 0.01536 b) 0.4328 c) 0.2458 d) 0.3241

20. In a sample of six patients using the drug, the probability that exactly two patients **don't** have undesirable effects is

- a) 0.01536 b) 0.4328 c) 0.2458 d) 0.3241

21. In a sample of 30 patients using the drug, the average number of patients expected to have undesirable effects is

- a) 4 b) 6 c) 8 d) 20
-

X is a discrete random variable with the following probability distribution.

X	1	2	3
P(X)	0.2	0.4	0.4

22. The mean of this distribution is

- a) 2.2 b) 0.33 c) 1.8 d) 2

23. The standard deviation of this distribution is

- a) 0.85 b) 1.46 c) 0.75 d) 1
-

24. Given the matrix $A = \begin{pmatrix} 3 & 8 & 2 \\ 2 & 1 & 2 \\ -1 & -2 & 0 \end{pmatrix}$.

The cofactor of the element a_{23} is

- a) -3 b) 3 c) 2 d) -2
-

Part II (40%) Answer each of the following questions, explain and show your work

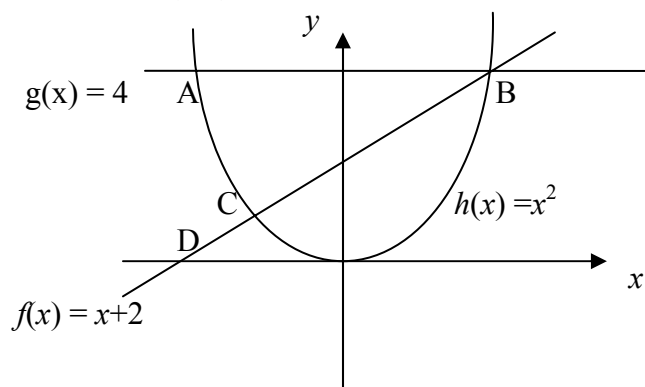
(8 %)

1. Given the system of equations $AX=B$,
$$\begin{cases} x_1 + 2x_2 + x_3 = 1 \\ 3x_1 + 7x_2 + 3x_3 = -2 \\ 5x_1 + 10x_2 + 10x_3 = 0 \end{cases}$$

- a. Use the Gaussian method to find A^{-1} , where A is the matrix of coefficients.
- b. Use A^{-1} to solve the given system.

(8%)

2. Given the following figure:



Find the coordinates of the points of intersection A, B, and C and D

Set the definite integral or the combination of definite integrals that give the area of the region bounded:

- a. the curve $h(x) = x^2$ and the straight line $f(x) = x+2$
- b. by the curve $h(x) = x^2$ and the two straight lines $f(x) = x+2$ and $g(x) = 4$.
- c. the curve $h(x) = x^2$,the straight line $f(x) = x+2$ and the x -axis.

(12 %) **3.** Evaluate each of the following integrals:

a. $\int \frac{(3 + \ln x)^5}{x} dx =$

b. $\int x^3 \ln x \, dx =$

c. $\int x^3 e^{-2x} \, dx =$

d. $\int \frac{2x}{(x-2)^2(x-3)} dx =$

4. Given the function $f(x) = \ln\left(\frac{(3x+5)^2(x^3+5)}{(7x+5)^3}\right)$ find $f'(0)$, the first order derivative of $f(x)$

(4 %) at $x = 0$.

5. Given the following table that summarizes some characteristics of 50 persons.

(8 %)

	A	B	C	Total
X	8		5	
Y		7		23
Total			16	50

Fill in the missing values and then answer the following

a. Are the events of the set $\{B, CY, X\}$ mutually exclusive, and/or collectively exhaustive?
(Explain)

b. Find:

$$P(A) =$$

$$P(C') =$$

$$P(A' \cup X) =$$

$$P(A'/X') =$$